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DOES CASH CONTRIBUTE TO VALUE? A COMPARISON OF CONSTRAINED AND UNCONSTRAINED FIRMS IN CHINA AND GERMANY†

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Abstract

A fundamental characteristic of emerging markets is the underdevelopment of legal institutions and financial markets. Therefore, the marginal value of a firm's cash holdings in emerging countries can be lower than 1, due to high agency costs resulting from poor external corporate governance. However, the marginal value of cash may also be high in emerging markets because the information asymmetry between current and new providers of funds is high, which means that it is difficult to access the (low quality) capital markets. We study for the industrialized countries of China and Germany whether corporate cash holdings contribute to shareholder value in both constrained and unconstrained firms. In contradiction to previous literature on emerging markets, we find that the marginal value of cash is not smaller than 1 in China, so that agency costs do not dominate. We, however, find marginal values of cash lower than 1 for unconstrained firms in both countries, implying that in these firms agency costs of cash holdings exist. For constrained firms we find marginal values significantly larger than 1 in both countries. This indicates difficulties in accessing the financial markets for these firms. These difficulties prove to be larger in China than in Germany for small and service firms, but not for high growth firms.

Keywords: Cash, Marginal Value, Agency Cost, Information Asymmetry, Germany, China

1. Introduction

A fundamental characteristic of emerging markets is the underdevelopment of legal and financial institutions. Such characteristics are likely to influence the marginal value of cash holdings to the shareholders. This measure has recently received the attention of researchers (Faulkender and Wang, 2006; Pinkowitz *et al.* 2006; Dittmar and Mahrt-Smith, 2007; Pinkowitz and Williamson, 2007; Drobetz *et al.* 2010; Tong, 2011). According to the free cash flow theory, agency problems reduce the marginal value of a firm's cash holdings (Dittmar and Mahrt-Smith, 2007). On the other hand, firms would have a larger marginal value of cash holdings if the access of the firms to

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the financial markets is difficult (Pinkowitz and Williamson, 2007). In emerging markets, the marginal value of cash for firms can be higher because of the costly external financing arising from the limited quality of the capital markets. It may, however, also be lower due to high agency costs resulting from the poor external corporate governance. Therefore the determination of the marginal value of cash becomes an empirical question.

Previous studies investigate these two conflicting predictions and indicate that agency costs are dominant, i.e. the costs of holding cash outweigh the benefits of it (see Drobetz *et al.* 2010; Lundstrum, 2003). However, no studies have investigated the difference in marginal value of cash holdings between developed and emerging countries for different types of firms. When two types of firms have a different marginal value of cash holdings, the opposite effects may cancel each other out and this "average effect" may not be a good indicator of the quality of investor protection and the ease of access to financial markets. We therefore develop two hypotheses based on the implication of the free cash flow theory and the information asymmetry theory. We argue that the differences in the level of information asymmetry across countries may have more influence on financially constrained firms, and the differences in the shareholder protection are more likely to affect the marginal value of cash held by financially unconstrained firms.

Using a sample consisting of German and Chinese firms from 2000 to 2012, we do not detect a significant difference in the overall marginal value of cash holdings between developed and emerging countries. Contrary to the literature on emerging markets, we find that the marginal value of cash is higher than 1 in China. This is also the case in Germany. These findings imply that the information cost effects dominate the agency cost effects. However, when we discern constrained firms and unconstrained firms, we find comparable marginal values of cash significantly lower than 1 for unconstrained firms in both countries. This implies that agency costs exist in both countries and that they do not differ between China and Germany for unconstrained firms. For constrained firms we find marginal values significantly higher than 1 in both countries. This implies difficulties in accessing the financial markets for constrained firms in both markets. These effects are larger for small firms and for service firms in China, so that we infer a stronger relative information asymmetry between current and future providers of funds in China in comparison to Germany.

The remainder of this paper is organized as follows. In the next section, we review the literature and discuss the theoretical predictions on the marginal value of cash holdings and develop the hypotheses. Section 3 explains the design of the empirical tests, the data and the sample selection. Section 4 presents the results and Section 5 concludes.

2. Literature Review and Hypothesis Development

In line with the propositions of Modigliani and Miller (1958) and Miller and Modigliani (1961), the questions of how much cash to hold and what value shareholders place on an extra dollar of cash held by firms are irrelevant in the world of perfect capital markets. In such markets, holding cash has no costs since investors are fully informed and managers always maximize shareholders wealth (Pinkowitz and Williamson, 2007). In such markets, in the absence of taxes and transaction costs, firms can always raise funds without any costs and therefore liquidity does not enhance firm value (Opler *et al.* 1999). As such, the irrelevance of liquid assets implies that managers would not balance the marginal costs and benefits of liquidity and shareholder wealth would not be affected by firms' decisions on corporate cash holdings.

In the real world, however, firms operate in markets with taxes as well as information asymmetry and agency costs. Cash reserves provide flexibility which enable firms to finance daily activities and to invest in profitable projects (transaction motive and precautionary motive); on the other hand, holding cash also causes costs which are derived from the opportunity costs due to the interest foregone, the cost-of-carry, and the agency conflicts between managers and shareholders (Opler *et al.* 1999). Consequently, not only firms tradeoff the marginal benefits and marginal costs of liquid assets but also investors evaluate cash holdings based on their expectations on how these cash reserves are going to be used by managers (Pinkowitz and Williamson, 2007).

2.1. The Marginal Value of Cash Holdings and Agency Costs

Managers, as the agents of the shareholders, are supposed to maximize the wealth of their firms. When the interests of managers are fully aligned with that of shareholders, the managerial actions taken by managers which benefit themselves simultaneously maximize the wealth of the outside investors (Pinkowitz *et al.* 2006). Agency costs, however, arise when the interests of managers differ from those of the shareholders. In such a case, self-interested managers may pursue their own objectives at the expense of the shareholders. The issue of how to deploy cash holdings is always at the center of this conflict of interests since, as argued by Myers and Rajan (1998), cash can be transformed into private benefits more easily than other assets. According to the free cash flow theory of Jensen (1986), firms with excess cash are more likely to incur agency costs, due to the fact that internal financing keeps managers from being monitored by the capital markets and this increases managerial discretion.

By and large, managers hold cash to reduce the likelihood of financing through costly external markets and incurring liquidity constraints (Martinez-Sola *et al.* 2013). However, when shareholder rights are limited, self-interested managers are more likely to hoard excess cash to pursue their own interests. They may do so in order to keep control because liquid assets can serve as a buffer that protects firms from adverse shocks (Pinkowitz *et al.* 2006). Moreover, they may also use these liquid assets to fulfill their desire of increasing the size and scope of firms and the resources under their control in 'empire building'. This hoarding of cash may result in subsequent suboptimal investment decision-making which decreases shareholder wealth, through frequent acquisitions or investing in negative NPV projects (Harford *et al.* 2008; Dittmar *et al.* 2003). Lastly, controlling shareholders may also divert such accumulated resources for personal interests through tunneling (Johnson *et al.* 2000). Overall, one would expect that the more discretion the managers have, the more likely they are to waste corporate assets in the pursuit of private benefits.

Considering that managers may use the cash resources inefficiently, shareholders may choose to use corporate governance mechanisms to alleviate the free cash flow problem. In other words, when outside investors anticipate that managers will extract private benefits from their control of the liquid assets, they value cash held by firms less (Pinkowitz and Williamson, 2007). As such and other things being equal, one would expect that the marginal value of cash would be higher for shareholders in countries with better investor protection.

Previous studies investigated the effects of corporate government on cash holdings from different perspectives. Dittmar *et al.* (2003) find that firms in countries with weak shareholder rights hold two times more cash as firms in countries with strong investor protection. Pinkowitz *et al.* (2006) focus on this issue from the international perspective. Consistent with agency theory, they find that cash holdings are valued more in countries with better shareholders' legal protection. To test how this country level difference in governance mechanisms affect firms' market value, Fresard and Salva (2010) hypothesize that investors will value cash more when firms cross-list on the U.S. exchange and they find supportive evidence. Furthermore, the existing empirical studies provide little evidence of a positive relationship between firm level corporate governance structures and the value of cash. For instance, Harford *et al.* (2008) find that US firms with poor corporate governance tend to hold less cash and choose to use excess cash for value destroying acquisitions. Most importantly, their findings imply that the "true entrenchment requires low legal shareholder rights" (Harford *et al.* 2008, p.538). Kalcheva and Lins (2007) further explain why the existing empirical research on the U.S. in this area fails to find evidence that supports the agency theory: the country-level corporate "governance in the U.S. is strong enough, so that investors do not systematically discount the value of a poorly governed firm with excess cash" (p.1087). They argue that the country-level shareholder protection magnifies the benefit and costs of cash and they find that firms with weak corporate governance hold more cash and that this relationship is stronger in countries with poor legal shareholder protection.

2.2. The Marginal Value of Cash Holdings and Information Costs

Contrary to the free cash flow theory, Myers and Majluf (1984) argue that liquid assets have value since external financing is costly due to asymmetric information between investors and managers, thus financial slack can act as a buffer which enables firms to invest in positive NPV projects which they may otherwise have to skip. When the information asymmetry between firms and market is pronounced, it is likely that firms can only access to the outside capital market at high costs when they need the money. Therefore, firms that have value enhancing projects and that have to finance themselves externally with high costs would make suboptimal investment decisions, resulting in decreased future growth and firm performance (Denis and Sibilkov, 2010). Consequently, internally generated cash would be more helpful for both rational mangers and investors in this case. In other words, cash holdings are more valuable when the access to the external capital market is costly.

Consistent with this expectation, Faulkender and Wang (2006) report that the marginal value of cash holdings is higher for financially constrained firms compared to unconstrained firms. Contrary to their findings, Pinkowitz and Williamson (2004) find that cash is less valuable for firms with less access to the capital markets and they further argue that "…it appears that the investment opportunity set rather than the financing opportunity set of the firm has the greatest impact on the value that shareholders place on a firm's cash holdings" (p.2). Also Drobetz *et al.* (2010) find that the value of corporate cash holdings is lower in countries with a higher degree of asymmetric information problems. These conflicting results may be caused by the fact that these papers use only one overall measure of the marginal value of cash to a country and that they do not distinguish between the needs of constrained and unconstrained firms.

2.3. Developed and Emerging Countries

The previous theoretical arguments can be applied to developed and emerging countries. On average, emerging markets are characterized by the under-developed legal and by underdeveloped financial institutions. As documented by La Porta *et al.* (1997), countries with poorer investor protection, in terms of legal rules and law enforcement, are associated with smaller and limited capital markets. Therefore, based on existing theories and the characteristics of emerging markets, the empirical hypotheses may go in two opposite directions. The poor shareholder protection in emerging countries may cause severe agency costs of cash holdings and thus investors would discount cash held by firms (the agency cost view), while the excess cash holdings may also be valued at a premium due to the costly external financing in emerging markets (the information cost view).

Despite these two alternative theoretical arguments, existing empirical studies report one-sided evidence, i.e. they combine the high costs of external financing with weak corporate governance, and then measure if on average the costs of holding cash outweigh the benefit of it. For example, Fan *et al.* (2008) find that the internal capital market of firms is inefficient when corporate governance is bad and "there is no big need for mitigating financing constraints" (Fan *et al.* 2008, p.1). Similarly, De Angelo *et al.* (2002) argue that without good corporate governance, liquid assets provide managers substantial managerial discretion even when firms face financial constraints. Furthermore, the findings of Lundstrum (2003) suggest that the firms could not realize value from cash holdings when they face more agency problems.

We contend that on a country level, at least a distinction should be made between constrained and unconstrained firms, in order to avoid oversimplifying conclusions. The main aim of this study is therefore to explicitly distinguish between the opposite effects of country-level differences on the marginal market value of cash holdings. If one of the relationships is dominant, we cannot deduce that the opposite effect does not work at all, because it only plays a small part. If no relationship can be found, the conclusion that the market value of cash holdings is unaffected by both effects will also be inexact, since the conflicting effects may cancel each other out. For example, if there are only two firms in a country, the overall marginal value of cash holdings is the same when 1) both 'agency cost' effects and 'information cost' effects have no influence for both firms or 2) 'agency cost' effects and 'information cost' effects have the same

effects but with opposite signs for both firms or 3) 'agency cost' effects in one firm and 'information cost' effects in the other firm have the same effects (with opposite signs). In this sense we also assess the very strong implicit assumption of much of the previous country research that all firms in a country are affected by external environment to the same extent. Therefore, instead of being interested in the net effects, i.e. whether the marginal value of cash is higher in developed countries or in emerging countries, this study is primarily concerned with whether the two conflicting effects exist and whether they influence different firm categories in developed and emerging countries differently.

As discussed in Section 2.2, firms with costly external financing are more likely to give up attractive investment opportunities when the internal funds are not available and thus the marginal value of cash would be higher for financially constrained firms than for unconstrained firms (Faulkender and Wang, 2006; Denis and Sibilkov, 2010). The financially constrained firms refer to the firms which face high costs of external financing. For the firms which could raise external funds easily, the differences in capital market quality may be trivial and the better shareholder rights in developed countries would drive the marginal value of cash to become higher for financially unconstrained firms in those countries than in the emerging countries. However, the external corporate governance may be less important for financially constrained firms. The higher the costs of external financing, the higher the likelihood of forgoing positive NPV investment opportunities and thus the interests of managers and minority shareholders are more likely to coincide. Furthermore, the higher level of information asymmetry may amplify the benefit of holding cash for financially constrained firms and thus make the cash more valuable in emerging markets. Consequently, if both the 'agency cost effect' and 'information cost effect' are at work, it may be wise to distinguish financially constrained firms from unconstrained firms. The marginal value of cash would then be higher for financially unconstrained firms in developed markets than for those firms in emerging markets; while investors will place a higher value on cash held by financially constrained firms in emerging markets relative to those in developed markets. These relationships are shown in Figure 1.

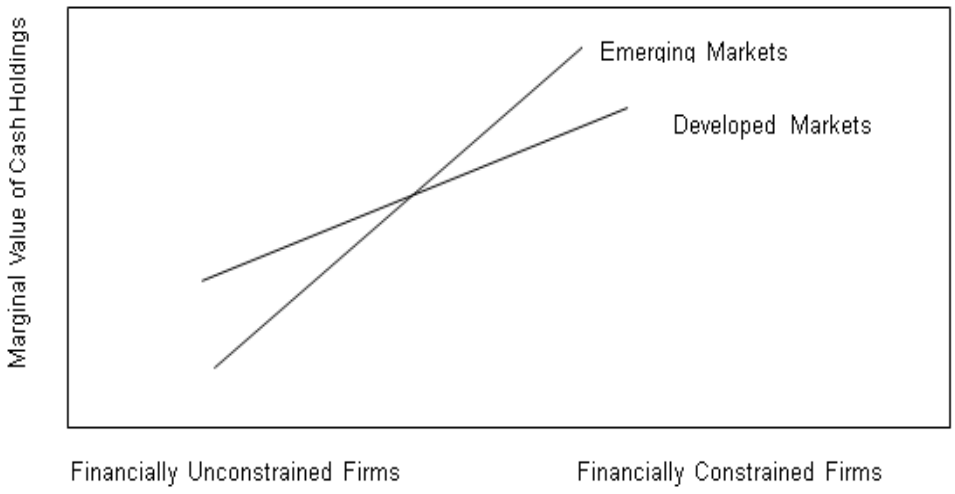

Figure 1. The Marginal Value of Cash in Emerging and Developed Markets for Unconstrained and Constrained Firms

This reasoning also leads to the following two hypotheses:
Hypothesis 1: For financially unconstrained firms, the marginal value of cash holdings is higher in developed countries than in emerging countries
Hypothesis 2: For financially constrained firms, the marginal value of cash holdings is higher in emerging countries than in developed countries.

3. Methodology and Data

3.1. Methodology

To investigate the differences in marginal value of cash holdings across developed countries and emerging countries, we use a regression model which relates the change of firm value to an additional dollar held by firms as well as to changes in other firm characteristics. Faulkender and Wang (2006) develop an empirical methodology to estimate the marginal value of cash holdings in relation to corporate financial policies. We build on the long-term event study method based on Faulkender and Wang (2006) to measure the marginal value of corporate cash holdings. Specifically, our baseline regression equation is as follows:

$$r_{i,t} = \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_5 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_6 \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_7 L_{i,t} + \gamma_8 \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_9 L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{10} MB_{i,t-1} + \gamma_{11} S_{i,t-1} + \epsilon_{i,t} \quad (1)$$

where $\Delta X_{i,t}$ indicates the change in the level of variable *X* of firm *i* from year *t-1* to year *t*; $r_{i,t}$ indicates the stock return during year *t*; $M_{i,t-1}$ is the market value of equity of the previous year *t-1*; $C_{i,t}$represents the cash holdings at time *t*; $E_{i,t}$ is earnings before interest and extraordinary items; $NA_{i,t}$ is net assets of year *t*; $I_{i,t}$ is interest expense; $D_{i,t}$ is total dividend; $L_{i,t}$ indicates the market leverage at the end of year *t*; $MB_{i,t-1}$ and $S_{i,t-1}$ stand for the market to book value and size of firm *i* at the beginning of year *t*, respectively.

The dependent variable $r_{i,t}$ is firm *i*'s stock return over year *t*. According to Fama and French (1993), size and market-to-book ratio capture common variation in stock returns. We control for the expected stock return by incorporating Size ($S_{i,t-1}$) and market-to-book ratio ($MB_{i,t-1}$) as control variables on the right-hand-side of our regression model. By doing so, we deviate from Faulkender and Wang (2006), who subtract the returns of 25 portfolios (based on five Fama and French size and for each size portfolio also five book to market portfolios) from the concomitant firm's raw returns. With regard to other independent variables, we follow Faulkender and Wang (2006) by controlling for changes of firm's profitability ($E_{i,t}$), financing ($I_{i,t}$,$D_{i,t}$,$L_{i,t}$) and investment ($NA_{i,t}$).[1] Furthermore, the interaction terms, $\frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}}$ and $L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}}$, are added since they argue that the marginal value of cash is decreasing with the increase of corporate cash position and debt level. Accordingly, including lagged relative cash holdings and leverage is to ensure that the estimates of the interaction terms reflect the effects of cash position and leverage level on the marginal value of cash correctly.

The first task is to test whether the marginal value of cash holdings is higher for shareholders in developed countries than in emerging countries or the other way around. We then do not yet discriminate between financially constrained and unconstrained firms. If the underdeveloped financial systems make investors in emerging countries to believe that the costs of asymmetric information is higher than the costs of agency problems, corporate cash holdings would be more valuable for shareholders in emerging countries. Alternatively, if investors in emerging countries believe that the poor shareholder protection would cause severe agency costs which may outweigh the costs of asymmetric information, the marginal value of cash would be lower for shareholders in these countries.

To test this, we make the country dummy interact with the change in cash holdings and run the double-fixed effect panel regression as follows[2]:

$$r_{i,t} = \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_5 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_6 \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_7 L_{i,t} + \gamma_8 \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_9 L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{10} MB_{i,t-1} + \gamma_{11} S_{i,t-1} + \gamma_{12} CDUM * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \epsilon_{i,t} \quad (2)$$

[1] R&D expenditure ($RD_{i,t}$) and net financing ($\Delta NF_{i,t}$) are excluded from our baseline regression model because of insufficient data.

[2] Note that we use fixed effect panel regressions, so the Country dummy (CDUM) is not included in the model.

The interaction term, Country dummy*Δ Cash holdings, is introduced to capture the effects of country-level differences on the marginal value of cash holdings. The country dummy, $CDUM$, is set equal to 1 for firms in emerging countries and 0 for firms in developed countries. As such, the coefficient γ_{12} represents the additional marginal value of cash in emerging countries in comparison to developed countries.

3.2. Sample, Data and Summary Statistics

In this study, we use a sample consisting of German and Chinese firms. Germany (developed country) and China (emerging country) are both industrial countries and the largest economic entities in Europe and Asia, respectively. It is thus interesting to empirically test the difference of the market value of cash holdings in these two counties.

We obtain firm-level data from Datastream (stock market data) and Thomson Financial's Worldscope database (accounting data). The initial sample consists of all firms listed on the Frankfurt stock exchange (German firms) and on the Shanghai and Shenzhen exchanges (Chinese firms) from 1999 to 2012.[3] First, firms with incomplete data are excluded from our sample. We then exclude financial firms (Standard Industrial Classification (SIC) code between 6000 and 6999) due to the involvement of cash and marketable securities in inventories; and the utility firms (SIC code between 4900 and 4999) that are subject to regulatory supervision from the whole sample as well (Opler *et al.* 1999). Furthermore, because cross-listed firms may be subject to different regulations and thus bias the results, we drop firms that are cross listed on German and Chinese exchanges by identifying the prefix of ISIN (International Security Identification Number) code. Accordingly, firms without SIC or ISIN code are eliminated from the whole sample.

As the Datastream and Worldscope data are expressed in local currencies, we convert renminbi (RMB) into euro (EUR) so as to ensure the comparability of the subsamples.[4] The market return is calculated as the change of market value (Datastream item MV) throughout the whole year, $M_{i,t}-M_{i,t-1}$, over the market value at the beginning of the year, $M_{i,t-1}$. Cash holdings are defined as cash and cash equivalents (Worldscope item 02005). Earnings are net income before extraordinary items (Worldscope item 01751) plus interest expense on debt (Worldscope item 01251).[5] Net assets are calculated as total assets (Worldscope item 02999) minus cash and cash equivalents (Worldscope item 02005). Dividends are total cash common dividends paid (Worldscope item 05376). Leverage is defined as total debt (Worldscope item 03255) divided by the sum of total debt and market value of equity (Datastream item MV). Size is measured as the natural logarithm of total assets (Worldscope item 02999). We also use market value to book value (Datastream item MTBV) and interest expense (Worldscope item 01251).

Following Faulkender and Wang (2006), we exclude all the observations with negative net assets, market value or dividends. All the variables are winsorized at 5% and 95% tails to mitigate the potential bias due to outliers. After the screening process, our final sample contains 780 (893) firms with 7,126 (2,944) firm-year observations for German (Chinese) firms.

In a world characterized by imperfect capital markets, larger firms have a greater ability to increase external funding since they are generally more mature, better known and less risky than small firms (Almeida *et al.* 2004). Therefore, to further test the implications of the 'agency cost effect' and the 'information cost effect', we use firm size, measured as the natural logarithm of total assets, as the first criterion to separate financially constrained and unconstrained firms (Faulkender and Wang, 2006). For each year of the sample period, we rank firms based on their size at the beginning of that year and assign the firms of which sizes are smaller (greater) than the median of the annual size distribution to the financially constrained (unconstrained) group.

[3] 1-year lagged data is required since the changes of some variables are needed according to the regression mode of this study.

[4] The exchange rates (as of December 31st of each year) we use come from http://www.xe.com/currencytables/.

[5] Faulkender and Wang (2006) calculate earnings as earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. We follow their method but do not include deferred tax credits and investment tax credits because of insufficient data.

Table 1 presents the summary statistics on the variables for the sample of German (Panel A) and Chinese firms (Panel B). We can see that the mean stock return of both German and Chinese firms is much higher than their corresponding median return, suggesting that the distributions of stock return of both samples are right-skewed. Moreover, the average annual return of Chinese firms (15.49%) is higher than that of German firms (9.52%). On average, German firms (26.88%) hold more than twice as much cash and cash equivalents as Chinese firms (13.21%) and the market leverage ratio is also significantly higher in German firms (23.78%) relative to Chinese firms (16.64%). The mean firm of both samples has similar size, but the German group has a larger standard deviation. Finally, the mean, median, minimum and maximum market-to-book ratios are all much higher in Chinese firms than in German firms; particularly, even the minimum market-to-book ratio of Chinese firms is more than 1 (1.1200) during our sample period.

Table 1. Summary Statistics for the 2000-2012 Sample Period

Variable	N	Mean	Std. Dev	Median	Minimum	Maximum
Panel A: Germany						
$r_{i,t}$	8565	0.095 a)	0.516	0.005 b)	-0.716	1.369
$\Delta C_{i,t}$	7665	0.006 a)	0.130	0.002 b)	-0.277	0.305
$\Delta E_{i,t}$	7465	0.034 a)	0.184	0.009 b)	-0.296	0.582
$\Delta NA_{i,t}$	7657	0.029 a)	0.344	0.030 b)	-0.785	0.797
$\Delta I_{i,t}$	7475	0.000 a)	0.014	0.000 b)	-0.036	0.032
$\Delta D_{i,t}$	7337	0.001 a)	0.014	0.000	-0.036	0.032
$C_{i,t-1}$	7843	0.269 a)	0.270	0.172 b)	0.017	1.026
$L_{i,t}$	8468	0.238 a)	0.232	0.175 b)	0.000	0.743
$S_{i,t-1}$	8722	11.965	2.075	11.619 b)	8.743	16.417
$MB_{i,t-1}$	8513	2.085 a)	1.695	1.550 b)	0.128	6.780
Panel B: China						
$r_{i,t}$	13557	0.155 a)	0.628	-0.049 b)	-0.564	1.870
$\Delta C_{i,t}$	13511	0.012 a)	0.061	0.005 b)	-0.091	0.165
$\Delta E_{i,t}$	13162	0.006 a)	0.032	0.003 b)	-0.060	0.090
$\Delta NA_{i,t}$	13501	0.087 a)	0.141	0.052 b)	-0.122	0.469
$\Delta I_{i,t}$	13163	0.002 a)	0.005	0.001 b)	-0.001	0.014
$\Delta D_{i,t}$	3024	0.002 a)	0.007	0.000	-0.012	0.019
$C_{i,t-1}$	13523	0.132 a)	0.104	0.102 b)	0.013	0.388
$L_{i,t}$	15505	0.166 a)	0.150	0.125 b)	0.000	0.502
$S_{i,t-1}$	16467	11.943	1.083	11.879 b)	10.069	14.222
$MB_{i,t-1}$	13492	3.973 a)	2.548	3.240 b)	1.120	10.680

Notes: This table contains descriptive statistics (number of observations (N), mean, standard deviation (SD), median, minimum and maximum) of main variables for the two samples used in this paper: German (Panel A) and Chinese (Panel B) firms. The sample period is from 2000 to 2012. All the variables are

winsorized at 5% and 95% tails. $r_{i,t}$, is stock *i*'s annual return during year t. All variables except return (*r*), leverage (*L*), firms size (*S*) and market-to-book ratio (MB) are standardized by firm's lagged market value ($M_{i,t-1}$). $\Delta X_{i,t}$ represents the one-year change in the level of variable X. $C_{i,t}$ is cash holdings which is defined as cash and cash equivalents. $E_{i,t}$ is earnings before interest and extraordinary itemsplus interest expense on debt; $NA_{i,t}$ is calculated as total assets minus cash and cash equivalents; $I_{i,t}$ is interest expense; $D_{i,t}$ is total cash common dividends paid; $L_{i,t}$ is measured as total debt divided by the sum of total debt and market value of equity; $MB_{i,t-1}$ is market value to book value and $S_{i,t-1}$ is measured as natural logarithm of total assets. a) indicates that the means of two samples are significantly different from each other at a 5% level using t-test assuming unequal variances; b) indicates that the median of two samples are significantly different from each other at a 5% level based on a Mann-Whitney test.

4. Empirical Results

In this section, the results of our empirical tests are reported. We first examine the cross-country differences in marginal value of cash between German and Chinese samples in Section 4.1. Then we investigate the implications of those two conflicting theoretical views ('agency cost theory' and 'information cost effect') in Section 4.2 by separating and comparing the financially constrained and unconstrained firms. Finally, we discuss the robustness of the results by subdividing the samples according to industry classification (Section 4.3) and growth opportunities (Section 4.4).

4.1. Marginal Value of Cash Holdings

We first measure the market value of cash holdings for the mean firms in different countries. The results of the regression models (equation 1 and equation 2 discussed in Section 3.1) are displayed in Table 2. The first and second column show that an additional euro of cash is worth €1.502 (€1.653) for the German (Chinese) firms with no debt obligations and no cash on hand. Furthermore, the significant negative coefficients of these two interaction terms for both groups are consistent with the findings of Faulkender and Wang (2006) who argue that both the cash balance and leverage have negative effects on the marginal value of cash. Although the 'no cash no debt' firms in China obtain more benefits from an additional euro of cash than those firms in Germany (€1.653 versus €1.502), the sensitivities of cash value to both the cash level and leverage are higher in Chinese firms. More specifically, other things being equal, the marginal cash value of a German firm with cash holdings equivalent to 10% of its market value is 5.85 cents lower (-0.585*10%) than a firm with zero cash balances, while a Chinese firm will lose 15.57 (-1.557*10%) cents of cash value by holding 10% more cash on hand. Similarly, for every 10% increase in leverage ratio, the contribution of one extra euro of cash to firm value will decrease 11.86 (11.97) cents for German (Chinese) firms.

Table 2. The Market Value of Cash Holdings

Independent variables	Germany	China	Whole sample
$\Delta C_{i,t}$	1.502*** (0.077)	1.653*** (0.233)	1.603*** (0.079)
$\Delta E_{i,t}$	0.263*** (0.027)	1.506*** (0.202)	0.302*** (0.027)
$\Delta NA_{i,t}$	0.230*** (0.016)	0.462*** (0.060)	0.211*** (0.016)
$\Delta I_{i,t}$	-1.691*** (0.356)	3.094* (1.621)	-1.792*** (0.361)
$\Delta D_{i,t}$	1.723*** (0.347)	0.671 (0.883)	1.263*** (0.343)
$C_{i,t-1}$	0.599*** (0.028)	1.108*** (0.115)	0.735*** (0.028)
$L_{i,t}$	-0.881*** (0.038)	-1.062*** (0.086)	-1.073*** (0.036)
$S_{i,t-1}$	-0.088*** (0.012)	-0.019 (0.022)	-0.087*** (0.011)
$MB_{i,t-1}$	0.068*** (0.004)	-0.042*** (0.004)	-0.069*** (0.003)
$C_{i,t-1} * \Delta C_{i,t}$	-0.585*** (0.114)	-1.557* (0.936)	-0.590*** (0.117)
$L_{i,t} * \Delta C_{i,t}$	-1.186*** (0.145)	-1.197* (0.716)	-1.297*** (0.147)
$CDUM * \Delta C_{i,t}$			0.064 (0.164)
Intercept	1.370*** (0.144)	0.449* (0.269)	1.400*** (0.137)
Observations	7,126	2,944	10,070
Adjusted R2	0.47	0.67	0.42

Notes: This table displays the results of fixed effects panel regressions examining the market value of cash holdings, covering the period from 2000 to 2012. All the variables are winsorized at 5% and 95% tails. The dependent variable, $r_{i,t}$, is stock *i*'s annual return during year t. All variables except return (*r*), leverage (*L*), firms size (*S*) and market-to-book ratio (MB) are standardized by firm's lagged market value ($M_{i,t-1}$). $\Delta X_{i,t}$ represents the one-year change in the level of variable X. $C_{i,t}$ is cash holdings which is defined as cash and cash equivalents. $E_{i,t}$ is earnings before interest and extraordinary itemsplus interest expense on debt; $NA_{i,t}$ is calculated as total assets minus cash and cash equivalents; $I_{i,t}$ is interest expense; $D_{i,t}$ is total cash common dividends paid; $L_{i,t}$ is measured as total debt divided by the sum of total debt and market value of equity; $MB_{i,t-1}$ is market value to book value and $S_{i,t-1}$ is measured as natural logarithm of total assets. *CDUM* is a dummy variable which is set equal to 1 for firms in China and 0 for firms in Germany. Standard errors are in parentheses. *, ** and *** indicate significant at 10 percent, 5 percent, and 1 percent level, respectively.

Recall that the average German (Chinese) firm holds cash which equals to 26.88% (13.21%) of their market value of equity, and the mean leverage ratio is 23.78% (16.64%). Therefore, the value of an incremental euro to shareholders is €1.06 (=€1.502+ (-€0.585*0.2688) + (-€1.186*0.2378)) and €1.25 (=€1.653+ (-€1.557*0.1321) + (-€1.197*0.1664)) in the mean German and Chinese firm, respectively. These results indicate that an extra euro of cash is worth more than its full value (1€) for mean firms, suggesting that investors in both countries may consider corporate cash holdings primarily as precautionary savings. Moreover, even though the marginal value of cash in Chinese firms is decreasing faster than that in the German counterparts as cash holdings and leverage increase, an additional euro of cash is still more valuable for Chinese firms because of their low cash and leverage level on average. However, as seen in the last column of table 2, the estimated coefficient of the interaction term, Country dummy*ΔCash holdings, is positive but insignificantly different from zero.[6] Thus, we cannot detect or infer a significant difference in the overall marginal value of cash between the two countries.[7]

4.2. Financial Constraints

As discussed earlier, if the marginal value of cash in one country is not significantly different from that in the other, the underlying reason could be that either both 'agency cost' effect and 'information cost' effect have no significant influence on firm value through cash holdings or that their opposite effects cancel each other out. Therefore, we split the sample into financially

[6] We also add the interactions terms, Country dummy* Cash holdings$_{t-1}$*ΔCash holdings and Country dummy*Leverage*ΔCash holdings, to verify our results are robust to the differences in the effects of cash and leverage level on cash values among counties. The main results do not change.

[7] The difference in marginal value of cash between the mean German firm (€1.06) and Chinese firm (€1.25) is also not significant a 5% level according to the Wald test.

constrained and unconstrained firms to test whether the country-level difference in marginal value of cash exists in different firm categories.

We separate for each country the sample into financially constrained (C) and unconstrained (U), while using three definitions of constraints. First, we consider that small firms are more constrained than large firms. Second, we assume that industrial firms are less constrained than non-industrial firms and, third, we assume that growth firms are more constrained than non-growth firms. Table 3 reports the regression results for firms smaller and larger than the median size. In Panel A the estimated coefficients of marginal value of cash (after controlling for the effects of cash holdings and leverage levels) is higher for financially constrained firms than for unconstrained firms for both the German and the Chinese samples. Moreover, the difference is significant at 5% confidence level for Chinese firms (1.051 versus 2.324 for financially unconstrained firms and constrained firms, respectively) but not for German firms (where the financially constrained firms also have a larger coefficient for the marginal value of cash (1.693) than the financially unconstrained firms (1.205)).This finding is consistent with the argument that the high cost of external financing increases the possibility of forgoing value enhancing projects and thus increase the benefits of holding cash. The relatively small and insignificant difference in the marginal value of cash between two German subgroups suggests that the developed capital market in German mitigates some market frictions for financially constrained firms.

Moreover, the absolute value of the estimates corresponding to the interactions, Cash holdings$_{t-1}$*ΔCash holdings and Leverage*ΔCash holdings, are higher for financially constrained firms than for financially unconstrained firms in both country groups. As the cash level reduces, both the likelihood of having to raise funds externally and the costs of doing so increase, and this relationship is stronger for financially constrained firms. So the incremental benefits provided by €1 extra cash in financially constrained firms are larger than that of financially unconstrained firms. These findings are consistent with the results of Faulkender and Wang (2006).

We then calculate the marginal cash value for the mean firms as above and report the results in the Panel B of Table 3. For financially unconstrained firms, one additional euro of cash held by a mean German (Chinese) firm contributes € 0.84 (€ 0.81) to its firm value. This implies that when external funds are easy to access (as in the case of large firms), firms are not supposed to hold excess cash and investors would consider the cash holdings as a potential source of agency problem and thus value the cash with 16 (19) cents less than its full value in Germany (China). This may be indicative of agency problems in the financially unconstrained (larger) firms. Though the marginal value of cash in Germany (€ 0.84) is somewhat higher than that value in China, the difference between German and Chinese unconstrained firms does not differ, suggesting that hypothesis 1 is not confirmed.

For the constrained (small) firms, the marginal value of cash is €1.22 and €1.79 for German and Chinese firms, respectively, and these values are significantly different from each other. Consistent with the 'information cost' view, the results suggest that constrained Chinese firms reap much more benefits from holding one extra euro than their German counterparts. When it is costly for firms to access external financial markets, the interests of managers are more likely to be aligned with those of investors for two reasons. On the one hand, the underinvestment problems resulting from high costs of external financing may result in decreased future growth and firm performance, which goes against the interests of both managers and shareholders. On the other hand, using firm size as the financial constraint criterion, the constrained (small) firms typically have less agency problems than financially unconstrained (large) firms according to Jensen's free cash flow theory (1986). As such, for constrained firms, the big difference in marginal value of cash holdings, €1.22 versus €1.79 (in Germany and China, respectively), reflects a disparity of capital market development between these two countries. In other words, the country-level information asymmetry is so pronounced in China that investors systematically value cash at a premium for financially constrained firms relative to the German counterparts. As such, the empirical results support hypothesis 2.

Overall, the results of our empirical tests provide strong evidence on 'information cost' effects, implying that the cross-country difference in financial constraints exerts a smaller impact

for financially unconstrained firms while they amplify the benefit of cash holdings for financially constrained firms.

Table 3. Fixed Panel Regressions for Small and Large Firms

Panel A

Independent variables	Germany		China	
	U (large)	C (small)	U (large)	C (small)
$\Delta C_{i,t}$	1.205***(0.104)	1.693***(0.120)	1.051***(0.303)	2.324***(0.449)
p(U-C=0)	0.30		0.04	
$\Delta E_{i,t}$	0.421***(0.038)	0.179***(0.038)	1.827***(0.231)	0.482(0.413)
$\Delta NA_{i,t}$	0.161***(0.020)	0.283***(0.027)	0.452***(0.066)	0.572***(0.135)
$\Delta I_{i,t}$	-1.731***(0.423)	-1.114*(0.605)	-0.850(1.798)	19.691***(3.657)
$\Delta D_{i,t}$	1.707***(0.393)	1.972***(0.615)	-0.509(1.021)	3.906**(1.694)
$C_{i,t-1}$	0.559***(0.038)	0.648***(0.044)	0.750***(0.129)	1.888***(0.265)
$L_{i,t}$	-1.077***(0.051)	-0.747***(0.060)	-1.105***(0.098)	-1.332***(0.197)
$S_{i,t-1}$	-0.088***(0.020)	-0.062***(0.019)	0.055(0.034)	-0.127**(0.050)
$MB_{i,t-1}$	-0.090***(0.006)	-0.065***(0.006)	-0.057***(0.005)	-0.034***(0.006)
$C_{i,t-1} * \Delta C_{i,t}$	-0.444***(0.140)	-0.702***(0.188)	-0.401(1.032)	-3.502(2.711)
$L_{i,t} * \Delta C_{i,t}$	-0.816***(0.189)	-1.511***(0.256)	-0.665(0.794)	-1.296(1.958)
Intercept	1.655***(0.273)	0.856***(0.203)	-0.381(0.432)	1.595***(0.572)
Observ. d)	3,727	3,399	1,577	1,367
Adjusted R2	0.52	0.49	0.72	0.66
Panel B				
$C_{i,t-1}$ (mean)	0.258 a)	0.280 a)	0.157 a)	0.107 a)
$L_{i,t}$ (mean)	0.310 a)	0.183 a)	0.236 a)	0.123 a)
The Marginal Value of €1	€ 0.84 c)	€ 1.22 b) c)	€ 0.81	€ 1.79 b) c)

Notes: This table presents results for unconstrained (U) and constrained (C) firms in 2000-2012. For each year we rank firms based on their size at the beginning of that year and assign the firms of which sizes are smaller (greater) than the median of the annual size distribution to the financially constrained (unconstrained) group. All the variables are winsorized at 5% and 95%. The dependent variable, $r_{i,t}$, is stock i's annual return during year t. All variables except return (r), leverage (L), firms size (S) and market-to-book ratio (MB) are standardized by firm's lagged market value ($MB_{i,t-1}$). $\Delta X_{i,t}$ represents the one-year change in the level of variable X. $C_{i,t}$ is cash holdings which is defined as cash and cash equivalents. $E_{i,t}$ is earnings before interest and extraordinary items plus interest expense on debt; $NA_{i,t}$ is calculated as total assets minus cash and cash equivalents; $l_{i,t}$ is interest expense; $D_{i,t}$ is total cash common dividends paid; $L_{i,t}$ is measured as total debt divided by the sum of total debt and market value of equity; $MB_{i,t-1}$ is market value to book value and $S_{i,t-1}$ is measured as natural logarithm of total assets. p(U-C=0) is the p-value of the added interaction term (constrained dummy*$\Delta C_{i,t}$) to the equations.to test whether there is a significant difference in marginal value of cash between constrained and unconstrained firms. Standard errors are in parentheses. *, ** and *** indicate significant at 10 percent, 5 percent, and 1percent level, respectively. In Panel B a) indicates significant differences between German and Chinese firms at 5% level using the t-test and assuming unequal variances. b) indicates significant differences between German and Chinese firms at 5% level based on the Wald test c) indicates significant differences from 1 at 5% level based on the Wald test.

4.3. Industrial and Nonindustrial Firms

As Germany and China are both industrialized countries, it is also interesting to study whether the marginal value of cash differs by industry classifications. The arguments are similar to that of constrained and unconstrained firms. Compared to industrial firms, service firms are usually younger, smaller (due to a lower need for assets), and they have less collateral, which implies that they are more risky to investors. So liquidity would be more valuable for the service firms to finance their investments than for industrial firms. Moreover, less employees and more simple organizational structures may cause less agency conflicts in nonindustrial firms. In contrast, industrial firms are typically big and working in traditional and mature industries and they may

also have a more complicated organizational configuration and wider dispersion of ownership. This may therefore result in more severe agency problems between managers and investors. As such, one could thus assume that the marginal value of cash is smaller in unconstrained (industrial) firms in comparison to constrained (service) firms.

We split the sample of both countries into industrial and nonindustrial firms (based on SIC code) and find a further empirical support for our hypotheses. The regression results are presented in Table 4 below. As seen from Panel A, the increased amount of firm value associated with one unit change in cash holdings is higher in nonindustrial firms than in industrial firms for both countries (€1.440 versus €1.552 for the German sample and €1.222 versus €2.109 for the Chinese sample). However, the cross-industry difference in the marginal value of cash is only significant for Chinese firms (p-value=0.01). Panel B provides the marginal value of cash holdings of mean firms for each subgroup. Again, consistent with the 'information cost' theory, the higher level of information asymmetry amplifies the benefit of cash holdings for Chinese nonindustrial firms (€ 1.64 versus € 1.13), and the difference between these two numbers is statistically significant. Meanwhile, the marginal value of cash of the mean Chinese industrial firm is a little lower than that of German counterpart (€ 0.95 versus € 0.99), but they are not significantly different from each other, which implies that hypothesis 1 is –again- rejected.

However, information cost effects have a stronger impact on the marginal value of cash for nonindustrial firms and these results support our second hypothesis and they are also consistent with our earlier results when we made a distinction between small and large firms.

Table 4. Regression Results for Industrial and Nonindustrial Firms

Panel A

Independent variables	**Germany**		**China**	
	I	**N**	**I**	**N**
$\Delta C_{i,t}$	1.440***(0.108)	1.552***(0.111)	1.222***(0.319)	2.109***(0.339)
p(I−N=0)	0.70		0.01	
$\Delta E_{i,t}$	0.306***(0.039)	0.239***(0.037)	1.346***(0.253)	1.763***(0.343)
$\Delta NA_{i,t}$	0.180***(0.022)	0.273***(0.025)	0.358***(0.074)	0.741***(0.103)
$\Delta I_{i,t}$	-0.634(0.457)	-2.941***(0.566)	3.393(2.069)	3.146(2.599)
$\Delta D_{i,t}$	1.364***(0.441)	2.172***(0.553)	1.840(1.211)	-0.520(1.257)
$C_{i,t-1}$	0.624***(0.039)	0.628***(0.042)	1.033***(0.147)	1.266***(0.186)
$L_{i,t}$	-1.071 ***(0.051)	-0.666***(0.057)	-1.013***(0.110)	-1.219***(0.142)
$S_{i,t-1}$	-0.111***(0.017)	-0.067***(0.017)	0.005(0.028)	-0.080**(0.038)
$MB_{i,t-1}$	-0.082***(0.006)	-0.058***(0.006)	-0.037***(0.005)	-0.054***(0.007)
$C_{i,t-1} * \Delta C_{i,t}$	-0.428***(0.159)	-0.712***(0.164)	-1.253(1.149)	-0.188(1.724)
$L_{i,t} * \Delta C_{i,t}$	-1.234***(0.204)	-1.081***(0.217)	-0.536(0.921)	-2.813**(1.153)
Intercept	1.802***(0.211)	0.965***(0.195)	0.157(0.091)	1.226***(0.464)
Observations	3,694	3,432	1,760	1,184
Adjusted R2	0.49	0.47	0.67	0.70
Panel B				
$C_{i,t-1}$ (mean)	0.252 a)	0.286 a)	0.140 a)	0.122 a)
$L_{i,t}$ (mean)	0.275 a)	0.200 a)	0.172 a)	0.159 a)
The Marginal Value of €1	€ 0.99	€ 1.13 b) c)	€ 0.95	€ 1.64 b) c)

Notes: This table presents results for industrial firms (I: Standard Industrial Classification Code from 3000 to 5999) and nonindustrial firms (N) from 2000 to 2012. All the variables are winsorized at 5% and 95%. The dependent variable, $r_{i,t}$, is stock i's annual return during year t. All variables except return (r), leverage (L), firms size (S) and market-to-book ratio (MB) are standardized by firm's lagged market value ($M_{i,t-1}$). $\Delta X_{i,t}$ represents the one-year change in the level of variable X. $C_{i,t}$ is cash holdings which is defined as cash and cash equivalents. $E_{i,t}$ is earnings before interest and extraordinary items plus interest expense on debt; $NA_{i,t}$ is calculated as total assets minus cash and cash equivalents; $l_{i,t}$ is interest expense; $D_{i,t}$ is total cash common dividends paid; $L_{i,t}$ is measured as total debt divided by the sum of

total debt and market value of equity; $MB_{i,t-1}$ is market value to book value and $S_{i,t-1}$ is measured as natural logarithm of total assets. p(I-N=0) is the p-value of the added interaction term (industrial dummy*$\Delta C_{i,t}$) to the equations.to test whether there is a significant difference in marginal value of cash between industrial and non-industrial firms. Standard errors are in parentheses. *, ** and *** indicate significant at 10 percent, 5 percent, and 1percent level, respectively. In Panel B a) indicates significant differences between German and Chinese firms at 5% level using the t-test and assuming unequal variances. b) indicates significant differences between German and Chinese firms at 5% level based on the Wald test c) indicates significant differences from 1 at 5% level based on the Wald test.

4.4. The Marginal Value of Cash and Growth Opportunities

Lastly, using market-to-book ratios as proxies for growth opportunities, we separate each country sample into low growth and high growth subsamples and report the regression results in Table 5 below. Again, the estimated coefficients of the change in cash are highly significant for all subgroups. Moreover, the marginal value of cash is also larger in high growth firms in comparison to low growth firms, though the difference in the estimates between low growth opportunities and high growth opportunities is now only statistically significant for the German sample (p-value=0.00). For firms with average cash and leverage (panel B) and with poor growth prospects, one extra euro of cash is worth € 0.63 (€ 0.83) in mean German (Chinese) firms. In addition the significant difference between these coefficients means that the first hypothesis is rejected (for the third time).

Table 5 Panel B shows that additional cash holdings in firms with higher growth opportunities are higher than 1 in both countries as the marginal value of cash is €1.57 and €1.47 for German and Chinese firms, respectively. These findings are again in line with the results of Faulkender and Wang (2006) applied to growth firms: high growth firms are constrained and the marginal value of cash in these firms is higher than that in low growth firms. However, high growth firms in Germany happen to have a higher marginal value of cash than the comparable firms in China. This means that the underdevelopment of the financial opportunities in the emerging Chinese market (hypothesis 2) is not confirmed for growth firms. This might be caused by the abundance of growth in Chinese firms in comparison to German firms: because the occurrence of high growth in Germany is relatively rare, investors in German firms do value cash by which growth opportunities can be realized highly.

Table 5. Regression Results for Firms with Low and High Growth Opportunities

Panel A

Independent Variables	**Germany**		**China**	
	L	**H**	**L**	**H**
$\Delta C_{i,t}$	0.887***(0.104)	2.007***(0.122)	1.300***(0.286)	1.803***(0.416)
p(L−H=0)	0.00		0.71	
$\Delta E_{i,t}$	0.267***(0.032)	0.317***(0.050)	1.751***(0.260)	0.997***(0.323)
$\Delta NA_{i,t}$	0.211***(0.020)	0.306***(0.030)	0.384***(0.072)	0.628***(0.108)
$\Delta I_{i,t}$	-1.545***(0.430)	-1.336**(0.672)	5.267***(1.866)	-1.048(2.988)
$\Delta D_{i,t}$	1.834***(0.440)	1.662***(0.558)	0.608(0.986)	2.040(1.742)
$C_{i,t-1}$	0.397***(0.036)	0.815***(0.065)	0.408***(0.148)	1.512***(0.215)
$L_{i,t}$	-1.124***(0.054)	-0.865***(0.060)	-1.288***(0.112)	-1.164***(0.157)
$S_{i,t-1}$	-0.036*(0.019)	-0.091***(0.017)	0.096**(0.039)	-0.150***(0.034)
$MB_{i,t-1}$	-0.334***(0.023)	-0.056***(0.006)	-0.119***(0.015)	-0.049***(0.006)
$C_{i,t-1} * \Delta C_{i,t}$	-0.121(0.135)	-0.253(0.273)	-0.611(1.148)	-1.820(1.644)
$L_{i,t} * \Delta C_{i,t}$	-0.702***(0.172)	-2.106***(0.304)	-1.726**(0.846)	-1.071(1.312)
Intercept	1.133***(0.234)	1.332***(0.208)	-0.681(0.474)	2.097***(0.412)
Observations	3,600	3,526	1,489	1,455
Adjusted R2	0.52	0.52	0.74	0.67

Panel B				
$C_{i,t-1}$ (mean)	0.366 a)	0.172 a)	0.167 a)	0.097 a)
$L_{i,t}$ (mean)	0.308 a)	0.185 a)	0.215 a)	0.143 a)
The Marginal Value of €1	€ 0.63 b) c)	€ 1.57 c)	€ 0.83 b)	€ 1.47 c)

Notes: This table presents results for low (Low) and high (High) growth opportunities firms in 2000-2012. For each year we rank firms based on their market-to-book ratio at the beginning of the year is, and if it is smaller (greater) than the median firms are assigned to the low (high) growth opportunity group. All the variables are winsorized at 5% and 95%. The dependent variable, $r_{i,t}$, is stock i's annual return during year t. All variables except return (r), leverage (L), firms size (S) and market-to-book ratio (MB) are standardized by firm's lagged market value ($M_{i,t-1}$). $\Delta X_{i,t}$ represents the one-year change in the level of variable X. $C_{i,t}$ is cash holdings which is defined as cash and cash equivalents. $E_{i,t}$ is earnings before interest and extraordinary items plus interest expense on debt; $NA_{i,t}$ is calculated as total assets minus cash and cash equivalents; $l_{i,t}$ is interest expense; $D_{i,t}$ is total cash common dividends paid; $L_{i,t}$ is measured as total debt divided by the sum of total debt and market value of equity; $MB_{i,t-1}$ is market value to book value and $S_{i,t-1}$ is measured as natural logarithm of total assets. p(L-H=0) is the p-value of the added interaction term (High growth dummy*$\Delta C_{i,t}$) to the equations to test whether there is a significant difference in marginal value of cash between low and high growth firms. Standard errors are in parentheses. *, ** and *** indicate significant at 10 percent, 5 percent, and 1 percent level, respectively. In Panel B a) indicates significant differences between German and Chinese firms at 5% level using the t-test and assuming unequal variances. b) indicates significant differences between German and Chinese firms at 5% level based on the Wald test c) indicates significant differences from 1 at 5% level based on the Wald test.

5. Conclusions

We examine the differences in the marginal value of cash holdings across countries by using a sample of German and Chinese firms with panel data from 2000 to 2012. We use a long-term event study methodology and– contrary to the received literature- we do not find a marginal value of cash smaller than 1 in China, despite the fact that it has an emerging market economy. On average, the contribution of €1 extra cash holdings to shareholder value is €1.06 and €1.25 for German and Chinese firms, respectively. The marginal value of cash is higher for firms with a low cash level, a low debt level and for three measures of constrained firms, namely small firms, service firms and growth firms. These results hold for both countries and the differences between constrained and unconstrained firms are consistent with the findings of Faulkender and Wang (2006).

In line with our hypothesis we find that the marginal value of cash is higher in China than in Germany for small firms and for service firms. This suggests that information asymmetry differences across countries play a role in the valuation of cash holdings in firms with high costs of external financing. We, furthermore, do not find conclusive evidence on the differences between Germany and China for unconstrained firms. This implies that the difference in shareholder protection between Germany and China does not make a difference for these unconstrained firms.

We also find that the shareholders of German firms attach a higher marginal value of cash to high growth firms than they do to small and service firms. It suggests that German investors are concerned and are willing to allow these high growth firms to reap their growth opportunities and that they therefore prefer these firms to have relatively high cash holdings. In contrast, financial constrains of small firms and service firms are the main concern for the investors in China. This is not really amazing as the whole of the Chinese economy showed high growth rates, and small firms and service firms may then in particular have difficult access to financial markets.

Our findings have implications for managers, investors and science. In both countries it is not optimal for unconstrained firms to hoard cash and therefore cash levels in these firms could better be reduced. Constrained firms would -also in Germany- benefit from holding more cash. Overall, our findings suggest that it would be wise for investors to treat cash holdings in constrained firms differently from unconstrained firms and also to treat cash holdings in small

and service firms in China differently from cash holdings in comparable German firms. Finally, we think that scientists would do wise not to ignore the differences between constrained and unconstrained firms in country studies.

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